Social and Individual Vulnerabilities for Infection of Diseases by Hydro placements in Varzea Communities in the Municipality of Santarém-Pa

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Abstract— The low quality of water associated with the lack of basic sanitation, are some of the main factors that imply the transmission of diseases to the population. **Objective:** *To assess social and individual vulnerabilities for infection by waterborne diseases in floodplain communities in the municipality of Santarém-Pará.* **Method:** *This is an epidemiological, cross-sectional, descriptive, analytical study with a quantitative approach, carried out through statistical surveys, transcribed for the SPSS program by performing the X^2 test (Chi-square).* **Result:** *All data obtained showed significant p.* **Conclusion:** *Socioeconomic factors influence directly or indirectly on the human being's life condition, reflecting on the health and disease process, on the living conditions of riverside communities in the Amazon region.*

Keywords— Social vulnerability, Water, Water treatment.

I. INTRODUCTION

According to the World Health Organization, 85% of the population is affected by pathologies acquired from the ingestion of water or food contaminated with their respective pathogens. Thus, the low quality of water associated with the lack of basic sanitation, aggravated by the insecurity of the water coming from the population's supply system, the precarious conditions of hygiene, the very environment and provision of water and floods, are some of the main factors that imply the transmission of diseases to the population [1,2].

The fact that water is distributed irregularly in different regions of Brazil makes it necessary to know how it is arranged, and the environmental conditions in which it is inserted, since these factors can directly influence its quality, making it susceptible to possible contamination [3]. In rural areas and in floodplain communities, the risks of outbreak episodes are higher because of the possibility of contamination of water collections with pits and pasture areas occupied by animals [4].

Within this context, some microorganisms are related to the transmission of diarrheal infections, including viruses, bacteria and parasites, of which the following stand out: Rotavirus, *Escherichia coli* , *Shigella spp* , *Salmonella spp* , *Vibrio cholerae* , *Giardia spp* , *Cryptosporidium spp* , among others [5]. These pathogens that cause these diseases need water to complete

their life cycle, as they find a favorable environment in contaminated waters [6].

So, it is relevant to study the panorama to which these floodplain communities are inserted, in order to assess the social and individual vulnerabilities for waterborne disease infection in floodplain communities in the municipality of Santarém-Pará

II.   METHODS

This is an epidemiological, cross-sectional, descriptive, analytical study with a quantitative approach, carried out through a statistical survey on the vulnerabilities to the occurrence of waterborne diseases in the communities of São Ciríaco , Aramanaí Campus and Urucurituba located on the banks of the Amazon River in the municipality of Santarém in western Pará.

These communities are located on the right bank of the Amazon River, about an hour and a half trip by waterway, from the city of Santarém, in western Pará, with a population of approximately 600 people.

In this study, a form was applied that dealt with socioeconomic data and behavioral risk factors of these individuals, with 111 people arguing.

The information was coded and tabulated *using Microsoft Excel* 8.0 *software* , being evaluated the absolute frequency and relative frequency. Subsequently, they were transcribed to the SPSS program, performing the X^2 test (Chi-square), with a significance level (p) of 0.05 being established, with results presented in tables.

III.   RESULTS

Table 1 - Socioeconomic Factors of residents of the Santarém-Pará floodplain communities.

Variables	%	P
Number of residents / residence		<0.0001
Less than 3	16	
4 to 6	67	
6 to 10	15	
More than 10	1	
Family income		<0.0001
1 minimum wage	38	
2 minimum wages	12	
3 minimum wages	1	
4 minimum wages or more	0	
Without fixed income	49	
Degree of Education		<0.0001
Primary	9	
Fund. Complete	28	
Fund. Incomplete	34	
Complete high school	21	
Incomplete high school	6	
Incomplete higher	1	

p: level of significance .

Table 1, presented above, contains the socioeconomic data of the population with regard to the number of residents in each residence, highlighting those between 4 to 6 residents representing 67%, with a significance level of p < 0.0001, an important data for that study . Regarding family income, it was observed that the majority, 49%, do not have a fixed income, whereas 38% receive only a minimum wage. When performing the statistical test, it proved to be significant, with p <0.0001. Regarding the education level of the population, the indices of incomplete elementary education stood out with 34%, followed by complete elementary education in 28% of the sample, with significance of p < 0.0001 to the statistical test.

Table 2 represents the data on the origin of the water used in the community and the type of treatment carried out to consume it. The rate of 85% refers to water originating in the river and only 2% coming from the well, with a statistically significant level of p < 0.0001 being observed for the research . The water used for consumption that is treated with chlorine has 84% prevalence and that which is boiled, 16%. The other forms of treatment were not answered. After the statistical test, a level of p < 0.0001 was found, which is relevant to this study.

Table 2: Origin and treatment of water carried out by residents of the Santarém-Pará floodplain communities.

Variables	%	P
Origin of water		<0.0001
River	85	
Cacimba	0	
Well	2	
Lake	6	
Mineral	0	

Plumbing	10
Drinking water treatment	<0.0001
Chlorine	84
Boils	16
Filter	0
Does not treat	0
Others	0

Source: Socioeconomic form; p *: level of significance.

Regarding the use of drinking water for other purposes (Table 3), it was observed that 65% of residents do not use the same water they consume for other purposes, with only 34% responding to using it. On the statistical test, the level of significance was p <0.0026.

Table 3 - Use of drinking water for other purposes by residents of the Santarém-Pará floodplain communities.

Variables	n%
Yes	34%
No	65%
P*	<0.0026

Source: Form data; p * = level of significance.

In table 4, referring to the forms of water storage, the pot was found to be the most used, totaling 54.95%, followed by the water tank with 41.44 and the thermos with 2.70%. The level of significance, according to the statistical test, is p <0.0001.

Table 4 - Form of water storage carried out by residents of the Santarém-Pará floodplain communities.

Storage	n%
Water Tank	42.34%
Bowl	54.95%
Thermos	2.70%
P*	<0.0001

Source: Socioeconomic form; p *: level of significance.

Table 5 - Frequency of cleaning of the reservoir carried out by residents of the Santarém-Pará floodplain communities.

Frequency	n%
2 times per year	1.8%
Every 3 months	0.9%
Every 2 months	0.9%
1-2 times a month	7.2%
Once a week	32.4%
2 times per week	26.1%
Daily	13.5%
Every gallon change	16.2%
Do not know	0.9%
P*	<0.0001

Source: Socioeconomic form; p *: level of significance.

Table 5, shown above, refers to the data on the frequency of cleaning of the water reservoir, which found that 30.6% of the interviewed residents said they performed cleaning once a week, followed by each change of water. gallon, with a 16.2% index . The coefficient of community members who wash the water storage site twice a week was 14.4%, while 13.5% reported cleaning daily. The test applied to these variables showed a significance of p <0.0001.

IV. DISCUSSION

In riverside communities, it is common to have an average of three or more residents per residence, as shown in the present study (table 1), similar to that carried out by Silva and Moura [7] in four communities in the state of Pará, where a prevalence of 60 was found, 7% of houses with three to five residents. In rural areas, the picture of poverty is more widespread and an equal or greater number of people per household suggests that there is a deficit in the quality of life of residents, associated with low income, poor sanitation, hygiene, water and health care. which reflect on their health-disease process.

As for income, it is noteworthy that most of the research participants reported not having a fixed salary, followed by those who receive a minimum wage and, thus, support large families with insufficient values to meet the basic needs of all, making them vulnerable to environmental conditions [8] . Reality faced by families living in an area where the prospects for employment with a fixed income are minimal.

And this is not just a condition in the state of Pará, but was also evidenced in a study carried out in the semi-arid region of the Central Sertão do Ceará, where 50% of the participants receive up to half the minimum wage. In view of this, it is noted that individuals with common realities but from different regions are subject to the same living and housing conditions [8]. This aspect is even more evident when related to the educational level of these individuals.

Regarding the level of education of the research participants, no case of illiteracy was registered, unlike the study carried out in two communities on the extreme west coast of Ceará, where there was a total record of 86.7% illiterate [9]. As the data shows, this index is alarming in the Northeast region and contributes negatively to the development of the population as it is a serious example of social and educational abandonment [10].

Another study carried out in the flooded area of the state of Amapá shows a prevalence of 30.9% of people who have not yet finished elementary school, and 19.7% for those who have already finished elementary school, data that corroborate with what was observed in present study [11]. This question leads us to reflect that they have basic educational knowledge, despite living in regions where the difficulties to study are greater with regard to access to school, associated with the low income factor to acquire educational material. Therefore, this knowledge may not be sufficient for them to act as subjects weighted in the community in which they live, based on individual and collective learning.

The use of water directly from rivers is very common in the Amazon region, and permeating this issue, the precarious conditions of sewage collection and treatment are observed, which undoubtedly affect the quality of water resources, sources for many families, for example. account of the content dumped directly under the riverbed, which is worrying when there is a percentage of only 9.4% households in this region, served by an adequate sewage network [12].

Studies conducted by Giatti and Cutolo [12] in the legal Amazon through participatory diagnosis are similar to the results of this study, since in the District of Iauaretê, an indigenous land in the state of Amazonas, most community members claim to use water directly from the river due to the difficulty of transport and the distance to travel to other sources, as may be happening in the floodplain communities, since they are a considerable distance from the city of Santarém.

However, moving to a different regional reality, in the case of other non-urban areas, it may be common to use wells, as in the study by Magalhães et al [13] in the state of Minas

Gerais, in which 69.4% of respondents used this medium to capture water, already in this study, the minority has a well in their house, with the peculiarity of regions rich in water resources, such as the Amazon, and even the ease of obtaining water from a nearby natural source, a more viable choice for residents.

As for the particularly urban context in Duque de Caxias, Rio de Janeiro, shown by Freitas, Brilhante and Almeida [14], it shows that 67.29% of the residents are served by a general supply network and 32.27% by wells, differentiating themselves from the present study.

The way in which water is treated or stored is directly associated with the prevention or susceptibility to its contamination by microorganisms, being a configuration of both environmental and behavioral aspects [15].

Despite being a riverside community, there is a positive parameter when compared to areas closer to urban centers, although socioeconomic conditions are not as privileged, as seen before (table 1). Thus, it is possible to observe that the vast majority in this study uses the water chlorination method for its treatment, demonstrating that they have some degree of information on how to treat water, although they do not have a higher level of education. In contrast, Rocha et al [16] shows that 56% of respondents in Lavras, Minas Gerais, do not even use a type of water treatment.

Still in the context of the same state, in Paula Cândido, totaling 55 respondents in the rural area, there is an alarming coefficient of 51 participants (92.7%) not treating the water they drink, against only 4 (7.3%) who use chlorine for treatment. In the urban area, with 17 respondents, the numbers become more favorable, with 15 (88.2%) performing chlorination, and only 2 (11.8%) do not undergo any type of treatment [13].

Corroborating these studies, in Manaus, 146 people (49.8%) do not treat the water they use at home, 113 (38.7%) claim to add the chlorination method, and the boil is listed by 11 respondents (3 , 7%) [17].

The issue of water treatment in floodplain communities demonstrates that even if they do not have a complete or satisfactory education, combined with a low income, these community members choose to prevent themselves, although they may not understand for certain the relevance of using chlorine or the boil for your health and the community, but they have the notion that the water that comes to them may be unclean or contaminated.

In this sense, the procedure adopted by the majority of the population at the study site, the chlorination of water, is efficient in disinfection and in topics such as inactivation

of bacteria and viruses, stable residual effect, in addition to having low cost, simple handling, availability in the among others [18] . In this way, the highlighted points make it easier for the community to access this method, providing the possibility of better treating water and protecting against various waterborne pathogens.

The present study showed that most residents of the Santarém- Pa floodplain communities do not use their own drinking water for other uses. However, in a study carried out in the community of Ressaca do Congós , in Amapá, it was observed that the water used for consumption by these residents comes from the tap, totaling 96.3% [11] .

Corroborating this, in a riverside community in the city of Belém- Pa , 100% of the families stated that they use tap water for domestic use [19] and because this is a region located in the Amazon basin, it is understood that drinking water comes from river being also used for washing clothes, dishes and cleaning the house, becoming a worrying fact, as a microbiological analysis carried out in the hydrographic basin of the Caeté River, in the same state, proved to be outside the parameters of Brazilian legislation, putting at risk the residents of that region [20] . Still in this context, in the city of Parnaíba, state of Piauí, 1.4% of residents use water from wells or rivers to drink, wash clothes and food, increasing the vulnerability of infection by some micro-organism carried by water [21] .

In this way, the present results indicated that the residents of these floodplain communities, receive or received some guidance on the use of water that they consume is not the same used for other purposes. With this, it is possible to perceive the mobilization of health professionals regarding water-borne diseases in this region and their concern in preventing this population.

Regarding the storage of water for consumption, the prevalence of smaller water reservoirs was verified in the form of the present study, in this case the 54.95% pot. This corroborates the research by Esteves [19] in riverside communities in the municipality of Belém- Pa , where this same medium was found to be the main form of storage, with 63.64%. Thus, it is understood that the water stored by this means can be designated for the consumption and food preparation of these residents.

Still in this context, in studies carried out by Bernardes and Bernardes [22] , in the São Raimundo community of the Juruá river, the choice to store water in pots is due to the fact that it keeps the water fresh for consumption. Situation this can also be preferable for the residents of this research, where electricity is scarce.

Regarding the use of the water tank for storage, it is present in 42.34% of the results, as a second way of retaining water in these communities. But in studies carried out in the Conquista neighborhood of the city of Santarém- Pa , the water tank is the main form of storage, totaling 66.67% [23] since in this location the residents complain about the lack of it most of the day, while that the main source of water for the riverside communities comes from the river, due to its abundance and ease of acquisition.

Although the water tank is a container that allows a greater amount of water to be stored, it was not preferred by the residents, since activities such as washing dishes and clothes can be done on the riverbed.

It is important for this research to emphasize the use of the pot, since this utensil is present in greater number. Thus, it is assumed that this container, because it contains little liquid, allows easier and more frequent cleaning, as it does not take long to dry. In this way, before the water is stored it can be boiled and chlorinated in the right measure, avoiding contamination of these residents. These containers are, therefore, the most suitable for storing water for consumption by these families, due to the flexibility of use.

The conditions under which water is stored can be an immediate determinant of its contamination by pathogens. For example, if the home reservoir is in inadequate conditions, or even the use of an incorrect hygienic technique, and the frequency with which it is performed or not, affect this issue, directly affecting the health of a community [24,25] .

In contrast to the results found, in Paraná, both Delbemet al [26] and Tsutsui et al [27] , highlight in their work the lack of cleaning of the reservoirs, directly correlating them as a risk factor to the transmission of infectious diseases in both humans and animals.

In the same vein, another survey, carried out in Bahia, shows that of the 20 reservoirs verified, only one (5.00%) receives cleaning twice a year, every six months, while another (5.00%) has never been cleaned, and regarding the other 18 (90%), the interviewees were unaware of the period in which the last cleaning was performed [28] .

Therefore, as recommended by the National Health Surveillance Agency (ANVISA), it is pertinent that any water storage location should be cleaned at least twice a year, using bleach and water, diluting them according to the size the reservoir [29] .

Results such as those found in the communities studied, demonstrate that the technique of cleaning the water

reservoir at home ended up becoming a continuous and frequent habit among its residents, as most of them affirm to do it weekly, which appears as a positive point in these locations. , where an association with precariousness and lack of resources is erroneously printed due to the distance from the urban center. And yet, such practice tends to have favorable results with regard to water storage, avoiding its contamination by microorganisms present in the reservoir.

V. CONCLUSION

It is then assumed that socioeconomic factors influence directly or indirectly on the human being's living condition, reflecting on the health and disease process, on the living conditions of the riverside communities of the Amazon region.

As seen in the results obtained in this study, it was also observed that the form of storage, the treatment of water and the maintenance of its integrity is directly related to its quality and consequently the health of the individuals who consume it. Thus, when dealing with geographically and economically disadvantaged communities, it was possible to verify that, positively, they apply prophylactic measures to disinfect water.

Thus, health units are potentially allies in the process of reducing vulnerabilities in these communities, collaborating in the prevention and promotion of health, especially with regard to waterborne diseases, providing guidance and distribution of material for the treatment of water and patients.

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